



## Course Specification

Program(s): Zoology/chemistry  
Department offering the program: Zoology  
Department offering the course: Zoology  
Academic year: 4<sup>st</sup> year (Zoology chemistry)  
Date of Specification approval: **1/2016**

### A- Basic information:

Course Title	Code	Lecture	Practical	Total
Experimental embryology	Z470	36hrs(4h /w)	36hrs(4h /w)	72 hrs

### B- Professional Information:

#### [1]-Overall aims of course:

1. Confirm the role of experimental embryology in scientific research and community development.
2. Recognize the relationship and interactions among embryonic development, chemical teratogens and the environment.
3. Apply medical information technology in the fields of tissue culture (cloning - stem cell- the ability of cells to regenerate ..... and another).
- 4- Develop recognition and understanding of gametogenesis, fertilization, the stages of the embryonic development in different species of vertebrates, regeneration, Induction of differentiation and malformations.
- 5-Develop specific skills in experimental design procedure and analysis of experimental data.
- 6- Produce a well qualified graduates able to practice in the applied embryology, biotechnology and medicine fields.

#### [2]-Intended learning outcomes of course

##### **a-Knowledge and understanding:**

*By the end of the course the students will be able to:*

- 1- Demonstrate wide knowledge and comprehension of the theories, facts, concepts, fundamentals and techniques related to the experimental embryology.
- 2- -Illustrates the essential knowledge in embryology in order to understand stem cell, IVF, regeneration, embryonic differentiation
6. Demonstrate a profound understanding of how the chemistry of biological molecules determines their biological functions with a special consideration to the major metabolic pathways and their interactions in embryonic cells. teratogens. vertebrates

##### **b- Intellectual skills**

*By the end of the course the students will be able to*

3. Select several lines of related information to confirm, make evidence and test hypotheses related to recent progresses in research such as stem

cell and applications of IVF, induction of development and super ovulation.

6. Postulate and deduce mechanisms and procedures to deal with infertility , and teratology relevant to advanced approaches in embryology of different vertebrate classes.

7. Link and integrate subject-specific theories, interactions and modulation of the actions of different types of physiological regulators in embryos.

8. Assess tools used in the cultivation of embryos to postulate the role of various cell signaling mechanisms in regulating cellular functions and growth in embryos of different vertebrate classes.

### c- Professional and practical skills

*By the end of the course the students will be able to:*

1. Plan, and conduct investigations using appropriate procedures and techniques, write structural reports on the data in accordance with the standard scientific guide lines.

7. Consider variations inherent in dealing with embryos of different vertebrate classes .

8. Employ contemporary bioassays and tools of tissue culture.

9. Examine samples of embryos and prepare sections for identification of different types of cells and tissues.

### d- General and transferable skills

*By the end of the course the students will be able to:*

1. Use information and communication technology effectively.

2. Identify roles and responsibilities, delegate tasks, and set clear guidelines and performance indicators.

4. Work in a team effectively, manage time, collaborate and communicate with others positively.

5- Address the community linked problems with considerable attention to the community ethics and traditions.

### [3]- Contents: A- Lectures

week	Topic	No. Hours	Lecture	Tutorial/ Practical
1	- History of the early experimental embryologists 1- male and female genital systems 2- a- Hormonal regulation b- Super Ovulation and Contraceptive techniques	0	2+2	0
2	1 - Gametogenesis 2- - Cellular differentiation and embryonic induction -a-The role of nucleus in differentiation b-The role of cytoplasm in differentiation	0	2+2	0

	c- The role of environment on embryonic development			
3	1- Types of Fertilization 2-a- Fertilization in mammals b- Functions of placenta c- Parthenogenesis	0	2+2	0
4	1-Cleavage , blastulation, gastrulation 2-Regeneration a- Regeneration in invertebrates and in vertebrates b- Mechanism of regeneration	0	2+2	0
5	-Mid termex . 1- organogenesis 2- <u>Teratology</u> : a-Introduction b-Mutaions as a source of variations <ul style="list-style-type: none"> <li>• Gene mutations</li> <li>• Chorosomal aberrations</li> </ul>	0	2+2	0
6	1-Embryonic development of <i>Amphioxus</i> 2- Demonstration of abnormal development a-Periods of susceptibility to abnormal development b-Faulty inductive tissue interactions c- Normal and abnormal twins	0	2+2	0
7	1- Embryonic development of toad 2-Teratogenic factors a-Maternal b-Chemical c-Physical d-Mechanical	0	2+2	0
8	1- Embryonic development of chicken (early stages) + Short exam. 2-The tissue culture a. Introduction and aime of work b- Equipment required for cell culture.	0	2+2	0
9	1- Embryonic development of chicken ( late stages) Some applications on the cultivation of tissues and embryos 2 -a--In Vitro Fertilization and Embryo Transfer	0	2+2	0
10	1-Oral exam 2-Nuclear transplantation (cloning)& Stem cell	0	36	0

## B-Practical experiments

W	Items of practical experiments	No. Hours	Lecture	Tutorial/ Practical
1	1- Determination of the estrus stages in rat. 2- Dissection of male and female genital systems	8	0	2+2
2	1- Normal development of mice fetuses 2- T.S. of ovary and testis	8	0	2+2
3	1-Induced malformations of rat or mice fetuses+short exam 2- Cleavage + blastula + gastrula of <i>Amphioxus</i>	8	0	2+2
4	1- Stain the skeletal system of embryo by using alizarin red 2- Cleavage + blastula + gastrula of fishes	8	0	2+2
5	1-Mid term ex. -2-Cleavage + blastula + gastrula of toad	8	0	2+2
6	1- Definition for most morphological & anatomical malformations 2- T.S in different levels of toad embryo	8	0	2+2
7	1-Equipment required for cell culture 2- Cleavage + blastula + gastrula of chicken	8	0	2+2
8	1- Stain of sperm+ short exam 2- T.S in different levels of chick embryo	8	0	2+2
9	1- Permanent preparation & Preparation of chick embryo extract 2-T.S in different levels of chick embryo	8	0	2+2
10	Revision Final lab exame.	total 72	0	36

### 5.2 Assessment Schedule

Assessment 1- Short exam 3&8 weeks

Assessment 2 -Oral exam week 8 - 9

Assessment 3-activities. week 4-8

Assessment 4- Mid term week 4

Assessment 5-Final lab. .... week 10

Assessment 6-final written week 14

### 5.3. Weighting of assessments

Assessment 1- Short exam & semester work 11.5%

Assessment 2 -Oral exam 6%

Assessment 3- activities 2.5%

Assessment 4-Final lab ... 30%

Assessm 5-final written50%

Total %: 100%

## [6]- List of references:

6.1. Course Note .

**Teratology (2013):** <http://en.wikipedia.org/wiki/Teratology>.

6.2. Recommended Text Book:

**Carlson, B. M. (2009):** Human Embryology and Developmental Biology. 4<sup>th</sup> Ed. Mosby Elsevier. London, p. 451.

**Carlson, B. M. (1988):** Patten's Foundation of Embryology. 5<sup>th</sup> Ed. McGraw-Hill. USA, P.64

**Gilbert, S. F.(2003):** Developmental Biology. 7<sup>th</sup> Ed, Sinauer Associates, Sunderland, pp: 694–696.

**Gilbert-Barnes, E. (2010 ):** Review: Teratogenic Causes of Malformations. Annals of Clinical Laboratory Science, 40(2):99-114.

- **Larsen, W. J. (1993):** Human Embryology. Churchill Livingstone, New York.

## Teaching and Learning:

1. Data- show presentation.
2. Different types of microscopes.
3. Computers.
- 4- Whiteboard.
- 5- Animal house, rat or mice.
- 6-Course note.
- 7- Reserved samples.

## Course coordinator:

Name: Prof. Dr.Nehal Abu El- Naga

Head of Department of